REMARKS

Claims 1-10 are pending. Reconsideration and allowance based on the below comments are respectfully requested.

Prior Art Rejections

Claims 1 and 9

Claims 1-3 and 9 are rejected under 35 U.S.C. §103(a) as being unpatentable over Malinovich, et al. (U.S. 6,168,965) in view of Strnad (U.S. 6,338,974); claims 4, 5 and 8 under 35 U.S.C. §103(a) as being unpatentable over Malinovich, Strnad and Wheatley, et al. (U.S. 5,122,905); claim 6 under 35 U.S.C. §103(a) as being unpatentable over Malinovich, Strnad and Fjelstad (U.S. 6,583,444); and claim 7 under 35 U.S.C. §103(a) as being unpatentable over Malinovich, Strnad and Tamaki (U.S. 5,523,174). These rejections are respectfully traversed.

Claim 1

Claim 1 recites, *inter alia*, a semiconductor substrate on which a photoelectric converting portion is formed; a light –shading means for shading an incoming light reflected from a rear surface of the semiconductor substrate to said photoelectric converting portion, wherein said light-shading means is formed at an area corresponding to at least the photoelectric converting

portion, said area being on the side of the rear surface of the semiconductor substrate.

The Office Action alleges that Malinovich teaches every feature of claim 1 except a light-shading means for shielding an incoming light reflected from a rear surface of a semiconductor substrate. The Office Action alleges that Strnad provides the teachings of a light-shading means deficient in Malinovich and that the combination of Malinovich and Strnad produce applicant's claimed invention. Applicant respectfully disagrees.

To establish a prima facie case of obviousness, three (3) basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the references or to combine reference teaches. Second, there must be a reasonable expectation of success. Finally, the prior art reference or references when combined, must teach or suggest all the claimed limitations. MPEP §2143.

Applicant respectfully submits that the teachings of Malinovich and Strnad do not provide all the claimed limitations. Strnad teaches reduction of a rough surface on a substrate caused by mechanical polishing. This is accomplished using an oil technique that reduces the mountains and grooves found on the surface after polishing. See column 2, lines 5-62.

Malinovich teaches a method for producing a back illuminated CMOS image sensor in which the sensor is mounted on a substrate and then a second

surface 320 is made thin by an erosion process so that pixels fabricated on the substrate obtain an effective exposure to light. See column 6, lines 44-67. The image sensors 100 are separated from substrate 110 by an adhesive 420. See Fig. 4a of Malinovich.

Neither Strnad nor Malinovich teach a light-shading means for reflecting light from a rear surface of a semiconductor substrate, as claimed. Strnad simply provides a teaching that rough surfaces reflect some light, even on a substrate. Strnad provides no teaching that such a substrate could be used to provide a shading means to keep reflected light from entering a photoelectric converter.

Also, in an embodiment of Malinovich the substrate 410 (see Figs 4(A)-4(I)) over the sensors is not modified at all, let alone to provide a light-shading means. In another embodiment of Malinovich the substrate 640 (see Figs. 6(A)-6(I)) is reduced in thickness so that light can reach photo sensors. This is contrary to the teachings of the present invention in which reflected light is kept from entering photoelectric sensors.

Thus, as illustrated above, Strnad and Malinovich do not teach the claimed light-shading means formed on a rear surface of a substrate. For this reason alone, the combination fails to establish *prima facie* obviousness.

Further, there is no motivation to combine the teachings of the references. Malinovich makes no suggestion to provide any type of light-shading means within the CMOS sensor. The fact that Malinovich uses light

sensors yet fails to discuss reflection problems from the substrate, appears to suggest that reflective light entering the image sensor is not a problem with the Malinovich's device or that Malinovich does not contemplate, when a substrate is thinned, reflected light from the side of the rear surface of the substrate providing noise to the image. Therefore, a suggestion or motivation to use a light-shading means as claimed would not be present within Malinovich.

Furthermore, even if the teachings of Malinovich and Strnad are combinable, the mere fact that references can be combined or modified does not render the result and combination obvious unless the prior art also suggests the desirability of the combination. *In re Neals*, 916 F.2d 680, 16 USPQ2d 1430 (Fed. Cir. 1990). Simply stated, neither Malinovich nor Strnad teach or suggest modifying Malinovich to utilize the polishing technique taught in Strnad to produce a surface on the rear of a substrate of the CMOS wafer in Malinovich to provide a shading means from reflected light.

Therefore, in view of the above, applicant respectfully submits that a *prima facie* case of obviousness has not been established in regard to claim 1. Accordingly, withdrawal of the rejection in regard to claim 1 is respectfully requested.

Likewise, dependent claims 2-8, which depend from independent claim 1, are distinguishable over the cited references for the reasons above. Accordingly, withdrawal of the rejections in regard to dependent claims 2-8 is respectfully requested.

Claim 9

Claim 9 recites, *inter alia*, a forming step for forming a plurality of semiconductor devices on the front surface of a semiconductor substrate...and, a grinding step for forming a rough surface on the rear surface of the semiconductor substrate.

Strnad teaches that thinning of a substrate may cause a rough surface to appear on the substrate and thus reflect light. Strnad then teaches polishing of the substrate to remove the rough surface. However, Strnad does not teach or suggest intentionally obtaining a rough surface on a substrate, let alone on the rear of a substrate where semiconductor devices are formed on the front of the substrate, as claimed by applicant.

Further, as with claim 1, Malinovich also fails to teach such a feature. Malinovich teaches thinning of a substrate so that light may enter and reach a photo sensor. Nowhere in Malinovich does it teach or suggest creating a rough surface on a substrate.

Thus, the combination of teachings of Strnad and Malinovich do not teach all the claimed elements. For this reason alone, the combination fails to establish *prima facie* obviousness.

Further, there is no motivation to combine Strnad's teachings with Malinovich. Malinovich creates a CMOS sensor on top of a substrate 410. The substrate is first covered by an adhesive layer upon which a wafer is attached.

Strnad, as discussed above, teaches a polishing process that thins the substrate that can produce a rough surfaces on a substrate. The combination of Strnad's teachings with Malinovich's CMOS sensor would necessarily suggest thinning of Malinovich's substrate to achieve a rough surface by a polishing technique taught in Strnad. In one embodiment of regarding substrate 410, Malinovich does not suggest or teach thinning the substrate or creating a rough surface on the substrate, let alone using a polishing process to achieve a thinning of the substrate. Malinovich never suggests thinning the substrate which is over the image sensors. In fact, to the contrary, Malinovich teaches thinning of a wafer or more specifically, second surface 320 to a transparent thickness so that light can reach the sensor, not to provide a rough surface that will reflect light. In another embodiment Malinovich teaches thinning of substrate 640. However, this is accomplished to allow light to enter, not to provide a rough surface to reflect light.

Thus, one of ordinary skill wouldn't consider roughing the substrate of Malinovich. Therefore, as discussed with claim 1, simply because Strnad teaches polishing a substrate and Malinovich uses a substrate does not provide proper motivation to combine the two teachings. Thus, a grinding step for forming a rough surface on the rear surface of the semiconductor substrate, as recited in claim 9, is not taught or suggested by the combination.

Therefore, in view of the above, applicants respectfully submit that a proper *prima facie* case of obviousness has not been established regarding

claim 9. Accordingly, reconsideration and withdrawal of the rejection are respectfully requested.

Claim 10

The Office Action rejects claim 10 under 35 U.S.C.§103(a) as being unpatentable over Malinovich in view of Fjelstad. This rejection is respectfully traversed.

Claim 10 recites, *inter alia,* a forming step for forming a plurality of semiconductor devices on the front surface of a semiconductor substrate, and a bonding step for bonding a wiring board on the rear surface of said semiconductor substrate using light-shading adhesive the light-shading adhesive suppressing light reflected from the rear surface of the semiconductor substrate from reaching the semiconductor device.

The Office Action alleges that Malinovich combined with Fjelstad provides the features of claim 10. The Office Action provides Fjelstad to teach the claimed light-shading adhesive. The Office Action asserts that the epoxy resin disclosed at columns 7, lines 33-45 of Fjelstad constitute the claimed light-shading adhesive. Applicant respectfully disagrees.

Applicant respectfully submits that Fjelstad teaches an optical element that is encapsulated with a resin. The resin is cured such that it is either transparent, translucent or "fairly opaque" as disclosed in Fjelstad. The transmissivity of the resin depends on what wavelengths of light are desired to

reach the optical element. The optical element of Fjelstad must receive some light to operate, thus the capsule of Fjelstad is not designed to "shade" and "suppress" light from reaching the optical element, but instead permits light of certain wavelengths to reach the optical element.

As claimed applicant's invention suppresses reflected light from reaching the semiconductor devices. Fjelstad teachings are contrary to the claimed invention, since Fjelstad's resin is designed to allow light to enter through the resin.

Further, the light received through the resin in Fjelstad is direct light. The light is not reflected light from a substrate as claimed. Thus, applicant respectfully submits that Fjelstad does not teach applicant's claimed light-shading adhesive.

Further, even if the references were combinable, which applicant contends they are not, there would be no motivation to combine the teachings. Malinovich teaches an adhesive 420 that attaches a wafer 300 to the substrate 410. Malinovich teaches that the adhesive should be approximately 80 to 100 μm. Fjelstad, on the other hand, uses resin to encapsulate all optical elements. One of ordinary skill would not use a teaching of a resin that is used to encapsulate all optical elements in combination as an adhesive that requires a specific thickness and location as used in Malinovich.

Thus, one would not be motivated by the references or by the knowledge of one of ordinary skill in the art to combine the teachings of the two (2) references to achieve applicant's claimed features.

In view of the above, applicant respectfully submits that a *prima facie* case of obviousness has not been established regarding claim 10. Accordingly, reconsideration and withdrawal of the rejection are respectfully requested.

Conclusion

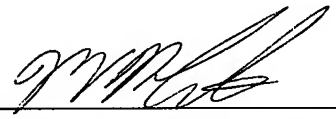
For at least these reasons, it is respectfully submitted that claims 1-10 are distinguishable over the cited art. Favorable consideration and prompt allowance are earnestly solicited.

Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact Chad J. Billings (Reg. No. 48,917) at the telephone number of the undersigned below, to conduct an interview in an effort to expedite prosecution in connection with the present application.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. §§ 1.16 or 1.17; particularly, extension of time fees.

Respectfully submitted,

BIRCH, STEWART, KOLASCH & BIRCH, LLP

By 

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